Research Article

Yinshan Zhengyao: exploring the power of food and inheriting healthy thoughts

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Abstract: Yinshan Zhengyao stands as a classic in health preservation, gathering the principles of the homology of food and medicine. The book is divided into three volumes, emphasizing the significance of food in the prevention and treatment of chronic diseases and health management. The book’s overall content predominantly comprises theories, prescriptions, and Materia Medica of Food, encompassing 237 prescriptions involving 174 medicinal plants from 55 families and 111 genera. The therapeutic effects of these dietary formulas can be divided into regulating the digestive, respiratory, endocrine, and nervous systems, possessing anti-aging properties, and safeguarding our body’s organs, presented in a diverse array of forms, including porridge, clear soups, hearty broths, pastes, decoctions, wines, noodles, vegetables with dishes, and cooked wheaten food. Yinshan Zhengyao showcases the significant role of the concept of medicinal and edible homology in traditional Chinese medicine culture. It provides practical experiences from ancient wisdom, offering a valuable resource for people to understand and apply the ancient Chinese wisdom of the homology of food and medicine.

Keywords: Yinshan Zhengyao; medicine and food homology; medicinal plants


1 Introduction

As an integral part of Chinese traditional medicine culture, the concept of “food as medicine” encompasses substances that serve both as food and medicines. It constitutes a material foundation for the prevention and treatment of chronic diseases. Moreover, it plays a crucial role as a carrier for China’s “Belt and Road” initiative and its participation in global health governance, fostering cultural exchanges between the East and West[9]. The saying “people regard food as their prime need, and nutrition as the foremost” reflects the cultural tradition of attaching great importance to dietary health in the Chinese nation. The principles of “medicine and food homology” not only form the theoretical basis for traditional Chinese dietary therapy and medicinal cuisine but also signify a long history of development. As early as the Zhou Dynasty, the imperial court in China had “food doctors” and during the Yuan Dynasty, the Imperial Dietitian Hu Sihui stood out as a notable figure. His work, Yinshan Zhengyao (the complete English translation of the title is A Soup for the Qan-Chinese Dietary Medicine of the Mongol Era as Seen in Hu Sihui’s Yinshan Zhengyao) not only stands as the first nutritional science treatise in the world but also covers dietary and medical knowledge from various ethnic groups and regions, including the Mongolian, Han, and Hui ethnicities, showcasing diverse culinary characteristics of the Han, Mongol, Hui, Arab, and other ethnicities and regions[1,3]. This work serves as a concentrated representation of medicine and food homology, as well as the cultural significance of dietary therapy within the Chinese nation.

During the mid-Yuan Dynasty, with the urgent demand for healthcare and wellness among the Mongol royal court nobility alongside the continual advancement in these fields, Yinshan Zhengyao emerged. This book offers a comprehensive overview of the dietary practices within the imperial court of its time, primarily rooted in Mongolian cuisine. It encompasses not only a rich array of food ingredients but also incorporates culinary terminology from various other ethnic groups. This affirms the linguistic impact of political, economic, and cultural development and exchange. Yinshan Zhengyao is rooted in traditional Chinese wellness philosophies, amalgamating Mongolian dietary customs and drawing from numerous achievements in both Eastern and Western dietary therapy. It espouses principles of preventive healthcare, dietary emphasis, and spleen-stomach regulation.

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Based on the wellness needs of the court and the dietary habits of the nobility at the time, it elaborates numerous theories and methods pertaining to dietary wellness and healthcare. Yinshan Zhengyao emphasizes dietary management, wellness-oriented dietary practices, and the pros and cons of various foods. In terms of health preservation, the significance of maintaining a cheerful mood and healthy eating habits is emphasized, along with the prevention of illnesses and the promotion of a healthy diet. Simultaneously, as a seminal work on courtly wellness during the Yuan Dynasty, Yinshan Zhengyao was crafted within a specific context, primarily showcasing the opulent diversity of courtly dining, the pronounced Mongolian influence, the fusion of Confucian and Daoist wellness philosophies, and the eclectic culinary borrowing from both domestic and foreign sources.

Yinshan Zhengyao is a significant work from the Yuan Dynasty, completed in the year 1330 during the third year of the Tianli era under the reign of Emperor Wenzong. Comprising three volumes, the book is structured into sections on theories, prescriptions, and Materia Medica of Food. In the theoretical section, there is an emphasis on health preservation, dietary taboos, and maternal and child healthcare. The primary objective is to assist individuals in disease prevention. The author’s focus is on preemptive healthcare, stressing the importance of maintaining health through sensible dietary habits. The formulations section, or dietary prescriptions, constitutes a vital component of the entire work. This section is subdivided into various chapters, such as “Gathering Rare Delicacies” (95 prescriptions), “Various Soups and Decoctions” (55 prescriptions), “Divine Elixirs for Consumption” (26 prescriptions), and “Dietary Treatment for Various Diseases” (61 prescriptions), totaling 237 formulations. These dietary prescriptions encompass not only meat-based foods for anti-aging purposes but also include medicinal soups and decoctions crafted from a variety of Chinese herbs. Furthermore, there are specific dietary prescriptions tailored to address particular illnesses, showcasing a rich practical value. The “Divine Elixirs for Consumption”, encapsulates dietary remedies reputed for their anti-aging, bone-strengthening, and longevity-enhancing properties. These include medicinal herbs such as Polygonyi Multiflori Radix, Rehmanniae Radix, Polygonati Rhizoma, and Asparagus Radix, among others. The “Materia Medica of Food” is another integral part of the book, encompassing 232 non-mineral, non-toxic substances categorized into seven groups: rice and grains (44 varieties, including 13 varieties of wine), meats (36 varieties), poultry (18 varieties), fish (21 varieties), fruits (39 varieties), vegetables (46 varieties), and seasoning (28 varieties).

The book provides detailed descriptions of the taste, properties, functions, and potential side effects of these food items. Some foods also come with illustrations (Fig. 1). This section offers a vivid presentation of information, serving as a robust reference for the creation of new dietary prescriptions. In conclusion, Yinshan Zhengyao reflects the author’s profound understanding of health preservation and the medicinal properties of food and herbs. It stands as a culturally significant work within traditional Chinese medicine (TCM), showcasing the wisdom of the era.

In the classical health guide Yinshan Zhengyao, a diverse range of ingredients is brought together, with medicinal plants assuming a crucial role as a vital component of dietary therapy. They not only enhance the flavors of delicious dishes but also, more importantly, showcase the profound principles of the TCM concept of medicine and food homology. Building upon the foundation of Yinshan Zhengyao, a more in-depth exploration of medicinal plants will unveil the subtle relationship between efficacy and diet within TCM culture. Yinshan Zhengyao covers a total of 174 medicinal plants, distributed among 55 families and 111 genera, with a majority from the Rosaceae (15), Poaceae (13) and Fabaceae (11) families. In TCM culture, medicinal plants are an indispensable part, utilized both in dietary therapy and as remedies for chronic conditions, contributing significantly to health and well-being. We will summarize and analyze the efficacy of dietary therapy formulations in Yinshan Zhengyao and organize knowledge concerning medicinal plants, showcasing the rich history and profound cultural heritage of medicine and food.

Figure 1  Medicinal plants with medicine and food homology in Yinshan Zhengyao. The plant illustrations on the left side of each small box are from Yinshan Zhengyao, while the photographs on the right side depict contemporary images of the same plants.
2 The efficacy of dietary therapy formulations

2.1 Regulating digestive system to enhance gastrointestinal function

Influenced by Mongolian dietary habits, therapeutic recipes in “Gathering Rare Delicacies” and “Dietary Treatment for Various Diseases” often utilize a combination of meat and medicinal plants to treat ailments. Dishes such as “Másúdái Táng” (soup), “Dámài Táng” (soup), “Bā’ěrbù Táng” (soup), “Shaqí móu’ér Táng” (soup), “Kūdòu Táng” (soup), and “Ācài Táng” (soup) are employed to regulate digestive system function, enhance gastrointestinal motility, and improve digestion. These dishes, known as “Tuófén” (porridge), and “Jītóufěn ǔgu Mián” (noodles), have a protective effect on the stomach and spleen. These therapeutic recipes refer to Nelumbinis Semen ground into powder.

Moreover, when encountering digestive disturbance or gastrointestinal discomfort such as a sensation of abdominal cold pain, remedies like “Sāsú Táng” (soup), “Xiānzhù Táng” (soup), “Sīhé Táng” (soup), and “Huíxiāng Táng” (soup) can alleviate the discomfort of abdominal cold pain. The formulations “Xiānzhù Táng” (soup), “Sīhé Táng” (soup), and “Huíxiāng Táng” (soup) all contain Foeniculi Fructus. A porridge composed of Piperis Fructus, Cinnamomum Cortex, and Armeniacae Semen Amarum (Jüe Mián) can alleviate cold discomfort in the abdomen, alleviate the sensation of obstruction and stuffiness in the chest and abdomen, and increase appetite.

Commonly used medicinal herbs include Tsaoko Fructus (31 prescriptions), Piperis Fructus (17 prescriptions), Alpiniae Officinarum Rhizoma (8 prescriptions), Zingiberis Rhizoma Recens (16 prescriptions), Armeniacae Semen Amarum (15 prescriptions), Alpiniae Officinarum Rhizoma (7 prescriptions), and Puerariae Radix (5 prescriptions), among others. In the third volume, they are classified as seasonings. Tsaoko Fructus, the fruit of the Amomum tsaokei, is a traditional medicinal and edible plant. Currently, a majority of Tsaoko Fructus in the market is utilized as a spice, imparting deodorizing and flavor-enhancing effects. Tsaoko Fructus possesses pharmacological effects such as regulating gastrointestinal function, antibacterial, anti-inflammatory, antioxidant, anti-tumor, hypoglycemic, and lipid-lowering properties. Its main chemical constituents include volatile oils, sterols, flavonoids, dipherilpenethanes, and bicyclic terpenes. Modern research suggests that the pharmacological effects associated with its traditional benefits mainly manifest in the gastrointestinal system, with the active components being volatile oils and phenolic substances. Preliminary identification indicates that 1,8-cineole, citral, trans-2-decenal, protocatechuc acid, and vanillic acid are potential quality markers. Many dietary therapy recipes in this book involve the combination of Tsaoko Fructus with other foodstuffs. These formulations can regulate gastrointestinal function, and treat conditions such as indigestion, loss of appetite, and abdominal distension. Additionally, they address symptoms arising from pulmonary and gastric functional imbalances, such as chest tightness, throat irritation, cough, and gastroesophgeal reflux disease.

Piperis Fructus, Zingiberis Rhizoma Recens, and Alpiniae Officinarum Rhizoma all help relieve gastrointestinal discomfort, vomiting, belching, and acid reflux. Piperine is one of the most effective components in Piperis Fructus and can treat gastrointestinal diseases. Piperine increases levels of prostaglandin E2 (PGE2) and epidermal growth factor receptor (EGFR) expression, inhibits the secretion of intercellular adhesion molecule-1 (CAM-1), heat shock protein 70 (HSP70), and hepatocyte growth factor (HGF), reduces endothelial cell damage, promotes endothelial cell proliferation, enhances mucosal repair, blocks gastric acid secretion, and protects the gastric mucosa. Piperis Fructus also increases gastric acid secretion and promotes intestinal peristalsis, helping to relieve symptoms such as abdominal pain, nausea, and vomiting. Zingiberis Rhizoma Recens can treat colds with chills, vomiting, phlegm retention, wheezing, coughing, and bloating. Alpiniae Officinarum Rhizoma primarily treats imbalances in gastrointestinal function and neurological and muscular dysfunctions of the gastrointestinal tract. Citri Reticulatae Pericarpium can treat bloating in the chest and abdomen, decreased appetite, vomiting, acid reflux, belching, and coughing with excessive phlegm. Cinnamomum Cortex can boost immunity, promote food digestion and absorption, and improve blood circulation. Ferulae Resina can help digest food residues, balance bodily discomfort, soothe stomach bloating, and eliminate intestinal parasites. It is often used to treat digestive problems from consuming meat, internal blockages caused by blood stasis, abdominal masses, and abdominal pain caused by parasitic infections. Croci Stigma can regulate gastrointestinal function, improve blood microcirculation, and have anti-inflammatory and antidepressant effects. While historically used as a culinary ingredient, Croci Stigma was generally avoided as a seasoning due to its stimulating effect on the pregnant uterus. Zanthoxyli Pericarpium, Piperis Longi Fructus, and Amomi Fructus help alleviate spleen and abdominal pain, indigestion, and diarrhea. It can be seen that as early as the Yuan Dynasty, the concept of “food as medicine” had already emerged. Meat, being relatively difficult to digest, could lead to a decrease in gastrointestinal digestion function if consumed excessively. Therefore, during the cooking process of meat, ingredients that promote gastric acid secretion, intestinal peristalsis, and digestive function were added to maintain normal digestive function.

2.2 Regulating respiratory system to suppress cough and asthma

In the therapeutic recipes of Yinshan Zhengyao, “Xingshuang Täng” (soup), “Shànyàó Täng” (soup), “Tàorén Zhòu” (porridge), “Kètè Bingèr” (cake), and “Guǎngüí kētè Bingèr” (cake) all have antitussive effects. Both “Xingshuang Täng” (soup) and “Shànyàó Täng” (soup) contain Armeniacae Semen Amarum, while “Tàorén Zhòu” (porridge) contains Persicae Semen. Both Armeniacae Semen Amarum and Persicae Semen have antitussive and asthma-relieving effects. However, Armeniacae Semen Amarum is toxic and should not be consumed in excess. Additionally, “Tàorén Zhòu” (porridge) can alleviate abdominal pain, feelings of obstruction, and fullness in the chest and diaphragm, as well as shortness of breath or wheezing.
2.3 Regulating the endocrine system to relieve dry mouth and thirst

In the second volume of *Yinshan Zhengyao*, various dietary therapies are mentioned that can alleviate symptoms of dry mouth and thirst while stimulating saliva secretion. These dietary therapies often incorporate medicinal herbs such as Mume Fructus, Schisandrae Chinensis Fructus, or Ginseng Radix Et Rhizoma. For example, formulations like “Lìzhi Gāo” (paste), “Méizì Wán” (bolus), “Wūwěizi Tāng” (soup), “Rènshēn Tāng” (soup), “Kètē Bingèr” (cake), “Guānguǐ Kètē Bingèr” (cake), and “Dābìna Bingèr” (cake) are commonly used. In modern clinical practice, diabetic patients frequently suffer from dry mouth and thirst. Several studies indicate that formulations containing Mume Fructus effectively alleviate these symptoms in diabetic patients[10-12]. Schisandrae Chinensis polysaccharides have shown some alleviating effects on insulin resistance in type II diabetes mellitus (T2DM) rats, possibly through activation of the AMPK/Nrf2/TXNIP pathway[13]. Ginseng α-amylase inhibition peptide demonstrates hypoglycemic effects and potential as an adjunct therapy for T2DM products or supplements[14]. Ginsenosides, as the main active ingredients of Ginseng Radix Et Rhizoma, can mainly be divided into two categories: protopanax-axadiol (PPD)- and protopanaxatriol (PPT)-type saponins[15]. PPD-type saponins have shown significant hypoglycemic effects in a T2DM mouse model[16]. Furthermore, ginsenosides Rk1 and Rg5, core active substances in PPD-type saponins, effectively improve insulin resistance in skeletal muscle by modulating glucose metabolism, thereby reducing fasting blood glucose and lipid levels[17]. In conclusion, dietary therapies have potential in alleviating symptoms of dry mouth and thirst and in assisting diabetes treatment, but further research and clinical validation are necessary for practical application.

2.4 Regulating renal function to relieve lower back and knee pain

The dietary therapies mentioned in “Dietary Treatment for Various Diseases” are partly excerpted from the dietary experience of predecessors, while others are innovations based on inheriting the medical experience of the past, mainly aimed at regulating kidney function, alleviating lumbar, knee, and back pain, as well as fatigue. These dietary regimens are similar to the “Gathering Rare Delicacies”, often combining with herbs with meat. For example, in dishes like “Yānggǔ Gēng” (hearty broths) and “Bàiyàngshèn Gēng” (hearty broths), lamb spine and lamb kidneys are paired with Cistanches Herba, Tsaoko Fructus, and Piperis Longi Fructus to alleviate lumbar and knee weakness, combat fatigue, and treat male sexual dysfunction. Cistanches Herba, native to the dry areas of Northwest China, is a precious tonic herb with a long history of use as both medicine and food. In TCM, Cistanches Herba is extensively utilized to alleviate physical fatigue, treat erectile dysfunction, alleviate lower back and knee soreness, as well as relieve constipation[18]. Contemporary pharmacological research indicates that Cistanches Herba primarily possesses functions such as neuroprotection, immune modulation, anti-aging, prevention of osteoporosis, and liver protection[19]. The echinacoside extracted from Cistanches Herba may inhibit the expression of Transforming growth factor β (TGF-β) and Vascular cell adhesion molecule-1 (VCAM-1) protein, renal interstitial fibrosis and renal tissue apoptosis, thus protecting the renal tissue of diabetic nephropathy rats and improving renal function[20]. In TCM, Rehmanniae Radix is widely used to enhance kidney function[21].

Dishes containing Rehmanniae Radix, such as “Hēiniānshú Jiàn”, “Shèngdìhuáng Zhōu” (porridge), and “Shèngdìhuáng Jī” can protect the kidneys, alleviate lumbar and back pain, and relieve limb weakness.

2.5 Regulating nervous system

2.5.1 Treating stroke

In “Dietary Treatment for Various Diseases”, there are many dietary prescriptions that can treat acute cerebrovascular diseases, addressing difficulties in speech, inarticulateness, mental confusion, and impaired limb movement caused by stroke. “Gēn Rèn” (soup), “Jīngjiè Zhōu” (porridge), and “Mázhǔ Zhōu” (porridge), and other therapeutic recipes can treat stroke. They contain medicinal herbs such as Schizonepetae Spica, Sojae Semen Praeparatum, Menthae Haplocalycis Herba, Cannabis Fructus, and Puerariae Lobatae Radix. Among them, Puerariae Lobatae Radix has the effect of treating stroke-induced hemiplegia[22]. Further research is required to explore whether these medicinal herbs have protective functions on cerebral blood vessels, promote blood circulation, and elucidate their mechanisms in treating strokes.

2.5.2 Calming hypnisis and relaxation mood

The *Yellow Emperor’s Inner Canon* states: “The human body has five viscera, which correspond to the five Qi, giving rise to emotions such as joy, anger, grief, worry, and fear”. This highlights the close relationship between human emotions and the five viscera, with each influencing the other. Intense emotional fluctuations often impair visceral function, leading to various diseases. Consequently, many acquired illnesses can be traced back to individuals’ emotions and lifestyle habits. Additionally, modern medicine confirms the intricate connection between certain diseases and factors such as diet, emotions, and lifestyle choices. The importance of maintaining a cheerful mood is particularly emphasized in the *Yinshan Zhengyao*. As such, it includes some therapy prescriptions aimed at calming the mind, promoting tranquility, and alleviating anxiety. “Suānzǎo Zhōu” (porridge) and “Shèngdìhuáng Zhōu” (porridge) can treat restless and insomnia. “Lǐměi Zhōu” (porridge) can relieve mental agitation and promote clarity of mind. The *Ziziphi Spinosae Semen* and *Nelumbinis Semen* contained in these prescriptions have calming and sedative effects, which can treat palpitations and insomnia. Research suggests that *Ziziphi Spinosae Semen* extract improves sleep by modulating the expression levels of γ-aminobutyric acid (GABA) receptor subunit alpha-1 (GABA_A,Ra1) and GABA receptor subunit gamma-2 (GABA_A,Rg2) in the hypothalamus and hippocampal tissues[23]. Additionally, “Lìzhi Gāo” (paste), “Bāměi Tāng” (soup), and other can alleviate mental agitation. “Chéng xiāng Bǐ” can treat respiratory discomfort caused by emotional depression.

It’s worth noting that TCM holds that diseases arise from imbalances within the body, resulting in interrelated effects among various organs. When using TCM treatments, it’s common to combine different TCMs to enhance effectiveness and minimize side effects. This process is akin to preparing a gourmet dish, requiring careful selection and combination of ingredients for the best outcome. Similarly, in the book *Yinshan Zhengyao*, this reflects the characteristic of herbal compatibility and the coordinated regulation of multiple organs. The therapeutic effects of therapy recipes in *Yinshan Zhengyao*, along with the corresponding medicinal plants and the number of dietary formulas, are illustrated in Fig. 2.
Aimed at treating edema and "Jiao Qi". This book, "Jiao Qi" refers encompass some dietary therapy formulations strategies.

Comprehensive, scientifically informed health management TCM with modern medical practices, and providing and efficacy of dietary therapies, facilitating the integration of medicinal herbs within the body. This will substantiate the safety absorption, distribution, metabolism, and excretion of these mechanisms of action, and understand processes such as pharmacological substance basis, elucidate the targets and necessary for these dietary therapies, particularly to determine the however, further pharmacological research and clinical trials are regulating internal homeostasis and systemic metabolic balance. Impacting overall health. Therefore, the kidneys are crucial in any disruption in fluid balance can affect kidney function, thereby affecting overall health. Therefore, the kidneys are crucial in regulating internal homeostasis and systemic metabolic balance. However, further pharmacological research and clinical trials are necessary for these dietary therapies, particularly to determine the pharmacological substance basis, elucidate the targets and mechanisms of action, and understand processes such as absorption, distribution, metabolism, and excretion of these medicinal herbs within the body. This will substantiate the safety and efficacy of dietary therapies, facilitating the integration of TCM with modern medical practices, and providing comprehensive, scientifically informed health management strategies.

In addition to the above-mentioned symptoms, Yinshan Zhengyao also encompasses some dietary therapy formulations aimed at treating edema and "Jiao Qi". This book, "Jiao Qi" refers to symptoms such as numbness, soreness, weakness, swelling, atrophy, and fever in the legs and feet, with the possibility of developing abdominal and cardiac symptoms in severe cases. “Jìyǔ Tāng” (soup), containing Vignae Semen, is effective in treating "Xiao Ke" (the symptoms of dry mouth, excessive thirst, increased drinking, and frequent urination.), edema, jaundice, and "Jiao Qi". "Máčī Zhōu" (porridge), containing Portulacae Herba, can address "Jiao Qi", facial edema, abdominal distention, and urinary difficulties. “Mùguā Tāng” (soup), with Chaenomelis Fructus, can alleviate symptoms like leg numbness, soreness, weakness, and swelling. These dietary therapy methods have been accumulated through long-standing traditional practices. While they may not necessarily apply to everyone or every situation, they might offer an alternative treatment approach for some individuals, especially those seeking natural, non-pharmaceutical interventions. However, for severe symptoms, it is still advisable to seek medical advice to ensure timely diagnosis and treatment.

2.6 The efficacy of materia medica of food

The difference from modern medicine lies in Yinshan Zhengyao showcasing the holistic and dialectical ideology of TCM, asserting that "everything can be medicinal". The third volume of Yinshan Zhengyao includes numerous commonly encountered foods in daily life, along with descriptions of their efficacy. In the third volume, medicinal plants are categorized into rice and grains, fruits, vegetables, and seasoning, covering a total of 132 medicinal herbs. The seasoning and fruits were discussed in the previous sections of the book, and now focus on rice grains and vegetables. The seeds of plants such as Oryza sativa L. var. glutinosa Matsum. O. sativa L., Setaria italica (L.) P. Beauv., and Panicum miliaceum L. can supplement human energy levels. Seeds of Cicer arietinum L. can alleviate symptoms such as thirst, polydipsia, and polyuria. Seeds of Vigna radiata (L.) R. C. can relieve discomfort caused by high temperatures. Seeds of Vigna umbellata (Thunb.) Ohwi & Ohashi can treat edema, dissipate heat and swelling, stop diarrhea and dysentery, and promote urination. Seeds of Vigna unguiculata (L.) Walp., Lablab...
Medicinal plants in dishes can be roughly categorized based on their therapeutic effects as follows: plants that can improve vision include *Brassica rapa* L., *Brassica juncea* (Linnaeus) Czernajew, *Allium fistulosum* L., and *Persicaria hydropiper* (L.) Spach. Those promising digestion and regulating gastrointestinal function include *Coriandrum sativum* L., *Raphanus sativus* L., *Daucus carota* var. *sativa* Hoffm., *Cucumis melo* var. *conomon* (Thunb.) Makino, *B. rapa* var. *glabra* Regel, *Glebionis coronaria* (L.) Cass. ex Spach, and *Beta vulgaris* var. *cicla* L. There are *Benincasa hispida* (Thunb.) Cogn., *Typha domingensis* Pers., lotus roots, *Dioscorea opposita* Thunb., *B. rapa* L., *B. vulgaris* var. *altissima* Döll, *Vicia sativa* L., and *Oenanth javanica* (Blume) DC. that can strengthen the body. Parasite-killing plants consist of *Portulaca oleracea* L., *Ulmus pumila* L., and *Stachys sieboldii* Miq.. Lastly, plants effective for treating abscesses and swelling include *Allium sativum* L., and *Lilium pumilum* Redouté. *Malva verticillata* var. *crispa* L., a member of the Malvaceae family, is the leading vegetable among various vegetables, exerting regulatory effects on various organs in the body. In summary, in the *Yinshan Zhengyao*, apart from dietary therapy formulations, both rice, grains, and vegetable dishes, as everyday foods, are documented for their impacts on bodily functions, emphasizing the therapeutic effects of each type of food. This reflects the Yuan Dynasty’s Imperial Dietitian Hu Si Hui’s perspective and the contemporary “food as medicine” philosophy upheld by present-day “food doctors”.

### 3 Discussion

In accordance with the 2020 edition of the pharmacopoeia, we have compiled a comprehensive summary of the Chinese medicinal herbs featured in *Yinshan Zhengyao*. Table S1 presents the botanical origins, traditional efficacy, and application, corresponding dietary therapy formulations, as well as modern research progress, including chemical compositions, pharmacological actions, and development and utilization status. The ultimate presentation of the dietary prescription is determined based on the characteristics of the food and the symptoms exhibited. Ointments are often chosen for physical debilitation, decoctions for acute illnesses, and flour-based or porridge-based preparations for daily consumption and gastrointestinal protection. Modern medicine tends to focus more on the chemical compositions and pharmacological actions of medicinal plants, while TCM places greater emphasis on their application within the holistic framework of TCM theory. Despite employing different research methodologies and theoretical frameworks, modern pharmacology and TCM are not mutually exclusive; rather, they can complement and enhance each other. Research on TCM should integrate modern scientific techniques and traditional medical theories to explore the pharmacological actions and clinical applications of herbal medicines from multiple perspectives, thereby maximizing their therapeutic efficacy. Therefore, research on TCM should be interdisciplinary and comprehensive, integrating modern scientific methods with traditional medical theories to continually deepen our understanding and utilization of herbal medicine. For instance, modern medical studies have revealed that these herbs possess pharmacological effects such as anti-Alzheimer’s, antidepressant, antibacterial, blood pressure-lowering, and lipid-lowering properties, none of which are mentioned in the *Yinshan Zhengyao*. In-depth investigation into the therapeutic mechanisms enriches the value of herbal medicine utilization and provides a foundation for the development and utilization of related products.

The therapeutic diet in *Yinshan Zhengyao* takes on various forms, including porridge, broth, soup, pastes, decoction, wine, noodles, dishes, and cooked wheaten food. It caters to diverse health needs and dietary preferences among different groups, showcasing the rich and colorful medicinal diet culture of the Yuan Dynasty. Simultaneously, it provides significant contributions to TCM dietary practices in areas such as culinary techniques, medicinal diet preparation, ingredient selection, and seasonal dietary considerations. Representative health-preserving medicinal diets exemplify exquisite and unique ingredient choices, integrating the diverse culinary characteristics of various ethnicities and regions. The book emphasizes not only the medicinal properties of medicinal plants but also underscores their comprehensive nourishing effects on the human body. The precise combinations and proportions of these medicinal plants can effectively regulate organ functions, supplement essential nutrients, fortify physical health, and promote harmonious operations within the body’s various systems. This approach aims to prevent diseases and maintain overall health. The concept of “food as medicine” permeates through every dish, making *Yinshan Zhengyao* an important book for the inheritance and development of this idea. It provides valuable references for the contemporary practice of integrating TCM with dietary principles. It serves as a valuable reference for contemporary practices in integrating TCM’s philosophy of medicine and food homology.

When inheriting the concept of medicine and food homology from *Yinshan Zhengyao*, we must carefully assess its feasibility and limitations in modern society. To begin with, the traditional idea of medicine and food homology poses challenges in terms of scientific validation. Although ancient texts mention numerous combinations of food and medicine, it doesn’t imply that each pairing has scientifically proven medical efficacy. Rigorous scientific experiments are needed to validate the actual therapeutic effects and safety of the formulations in *Yinshan Zhengyao*, rather than relying solely on traditional experiential validation. Moreover, *Yinshan Zhengyao* still contains content that requires confirmation, such as the origin of medicinal ingredients. The botanical source of “Kėtė” in the cough-treating dietary formula “Kėtė bingėr (cake)” within the “Various Soups and Decoctions” category remains to be verified. Moreover, the practical application of the concept of medicine and food homology in contemporary society might encounter limitations due to shifts in lifestyle and environmental changes. There have been significant alterations in modern dietary structures and lifestyles, with people increasingly reliant on processed foods and external supplements. In this scenario, promoting the concept of medicine and food homology may face practical challenges. The fast-paced nature of society and the demand for convenience make it difficult to integrate traditional methods of medicine and food homology into the lives of contemporary individuals. Hence, more flexible approaches are needed to adapt to modern lifestyles. To sum up, the compatibility of traditional dietary beliefs with modern medical theories and how they can beneficially supplement modern medicine needs to be thoroughly researched and explored.

In developing the concept of medicine and food homology in
Yinshan Zhengyao, it is crucial to explore it from multiple perspectives to ensure its effective inheritance and development in contemporary society. To begin with, the development of medicine and food homology requires substantive progress in scientific research and validation. The application of modern medical research methodologies, such as clinical trials and molecular biology, can be employed to validate the efficacy and mechanisms of dietary therapies outlined in Yinshan Zhengyao. Through in-depth scientific research, we can gain a more comprehensive understanding of the practical benefits of medicine and food homology, providing a reliable scientific foundation for its application in modern health management. This evidence-based approach to inheritance contributes to enhancing the credibility and practicality of the concept of medicine and food homology in contemporary society. Furthermore, since the release of the “List of Items that are Both Food and Medicine” by the National Health Commission of the People’s Republic of China in 2002, up to 2023, a total of 108 TCMs have been included in the list. Therefore, there is significant room for expansion in the list of medicine and food homology. New ingredients with dual medicinal and food properties can be introduced to enrich the recipes in Yinshan Zhengyao. Considering seasonal and regional variations, updating formulations can make them more in line with the dietary needs of contemporary individuals. This approach not only preserves tradition but also brings the concept of medicine and food homology closer to the lifestyle of modern people.

Simultaneously, for a more widespread transmission of the medicine and food homology concept, it is imperative to promote the idea of a healthy diet, integrating the health-preserving principles from Yinshan Zhengyao with modern concepts of healthy eating. Through public awareness campaigns and educational initiatives, disseminating the concept of medicine and food homology can guide individuals to pay attention to the impact of diet on their overall health. This promotional approach helps more people recognize the significance of medicine and food homology, encouraging its active integration into daily life. Interdisciplinary integration is also crucial for the inheritance of medicine and food homology. By combining expertise from fields such as medicine, botany, and nutrition, the theory of medicine and food homology can be more comprehensively understood. This interdisciplinary integration aids in deepening the understanding of the medicine and food homology philosophy in Yinshan Zhengyao and promotes its application across different domains. Establishing research platforms that facilitate interdisciplinary collaboration can better foster the inheritance and development of this concept. Ultimately, to enhance the practicality of the medicine and food homology theory, tailored dietary therapy plans can be developed for specific diseases. Drawing on modern medical understanding of various illnesses and incorporating the medicine and food homology principles from Yinshan Zhengyao, specific dietary recommendations can be formulated. For instance, specific medicinal dietary recipes are provided for common modern diseases like cardiovascular diseases and diabetes, allowing the targeted application of the concept of food as medicine for the prevention and treatment of specific conditions.

In conclusion, the concept of medicine and food homology in Yinshan Zhengyao provides important insights into modern health management. Developing this concept requires not only preserving its traditional essence but also integrating it with modern science, updating ingredients, promoting the concept, fostering interdisciplinary integration, and adapting it to contemporary needs. This approach is essential for achieving sustainable, comprehensive, and innovative development in modern health management.

4 Conclusion

The concept of medicine and food homology in Yinshan Zhengyao embodies profound TCM wisdom. It underscores the significance of food in preventing and managing chronic diseases. A variety of dietary regimens composed of medicinal plants can regulate the digestive, respiratory, endocrine and nervous systems, and also possess anti-aging and safeguard our body’s organs. To effectively inherit and develop this concept, it is imperative to integrate traditional essence with modern scientific insights. This involves updating ingredients, promoting the philosophy, and fostering interdisciplinary collaboration. Through education and advocacy, public awareness of the medicinal and edible homology concept can be enhanced, guiding individuals to place greater emphasis on the impact of diet on health. Guided by critical thinking, a comprehensive consideration of traditional values and realities ensures the sustainable inheritance and innovative development of this concept. This integration facilitates an effective synergy between traditional Chinese health practices and modern scientific approaches, offering valuable guidance for the health of contemporary individuals.

Conflicts of interest

The authors declare that there are no conflicts of interest. Min-Hui Li is the associate editor, Chun-Hong Zhang and Aruhan are the editorial board members of this journal, but they are not involved in handling, peer-review or decision of this article.

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Additional information

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References
